

Case Report

Role of Blood Transfusion in the Management of Obstetric Emergencies in the Gynaecology-Obstetrics Department of Gao Hospital (Mali)

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Abstract: The aim was to evaluate the role of blood transfusion in the management of obstetric emergencies in the gynaecology and obstetrics department at Gao Hospital. **Materials and methods:** This was a prospective, descriptive, cross-sectional, analytical study from January 01 to June 30, 2020, i.e. a period of six (06) months in the gynaecology-obstetrics department at Gao Hospital. **Results:** We recorded 536 cases of obstetric emergencies, of which 120 cases required emergency blood transfusion, i.e. 22.39%. The 20-29 age group was the most affected with an average age of 26.5 years. The extremes were 15 and 49 years old. About 95.8% of the transfused women were housewives. During our study, 99.2% of transfused patients were married. During our study, the majority of transfused patients were non-literate, i.e. 90% of cases. Referral/Evacuation was the most common mode of admission at 63.3%. The majority of women transfused had a haemoglobin level between 4 and 6 g/dl, or 55.8%. Whole blood was the only blood product for blood transfusion, accounting for 100% of cases. In 39.2% of the cases, we asked for 4 units of blood. 37.5% of patients had received at least 2 units of blood. During our study, 341 bags were prescribed, an average of 2.85 per patient. Of the 341 bags requested, 237 were served, which represents 69.5% of needs covered. The rate of unmet needs was 30.5% or 104 bags of blood. Retroplacental hematoma was the main indication for blood transfusion with 21.7% of cases. In 7.5% of patients experienced transfusion-related complications (malaria). 70.0% of patients had a haemoglobin level between 8 and 9 g/dl after transfusion. The majority of transfused patients were discharged from hospital (cured), i.e. 93.3%. **Conclusion:** The rate of unmet obstetric needs is high. This high rate can have a negative impact on obstetric prognosis.

Keywords: Blood transfusion, Obstetric emergency, Blood product, Maternal prognosis.

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INTRODUCTION

Blood transfusion involves moving blood or one of its cellular or plasma components through a venous route from one or more subjects called a "donor(s)" to a sick

subject called a "recipient". A distinction is made between labile blood products obtained by physical separation of blood and stable blood derivatives obtained by secondary fractionation of plasma [1]. The

logic of selective transfusion is to offer each blood product in the form most suitable in terms of purity and concentration on the basis of a principle which is: "the patient should receive only the blood component he needs" [1]. Despite efforts to improve blood safety, blood transfusion remains a risky therapy. This is why it must be observed with an approach, rules of good practice (collection, preparation, distribution, qualification) both at the level of the collection services and at the level of the clinical services responsible for the administration of blood products. The frequency of blood transfusion is increasing in Africa. In Abidjan, the hospital frequency of transfusion was 17% according to Febro in 1990 [2]. All pregnant women are at risk of obstetric complications resulting in a more frequent need for transfusion, with most complications being fatal during pregnancy, childbirth and/or postpartum [3]. These obstetric complications occur all over the world. They are common in developing countries where they are responsible for mortality and morbidity Feto- Kindergarten [4]. For example, prenatal screening does not identify all women who will experience complications (Rooks, Winikoff and Bruce 1990). Thanks to advances in technology (monitoring, anaesthesia-resuscitation), the serious consequences of obstetric accidents are clearly decreasing in Western countries. That is to say, Africa, which has not reached this stage of technicality, is paying a heavy price [5]. The WHO has estimated that every year worldwide at least more than half a million women die as a result of obstetric complications [6]. These same sources claim that 30% of deaths occur in Africa compared to 6,000 deaths recorded in developed countries per year. In Mali, the maternal mortality rate is 325 per 100,000 live births, according to the results of the DHS VI in Mali in 2018. These obstetric complications justify the numerous medical evacuations from a maternity ward to a better-equipped centre. They can sometimes be the consequence of insufficient care: Lack of therapeutic means; Lack of competent personnel; Delay in evacuation; Every woman needs access to facilities that are able to provide emergency obstetric care. Neither effective antenatal care nor risk identification will help women if emergency obstetric care is not available and accessible [7]. In obstetrics, haemorrhage is the leading cause of maternal mortality in developing countries. Despite this, none of our health facilities has a transfusion unit within it, which is in contrast to all the mobilizations that the government is making for a reduction in maternal mortality. Sango J F recorded 22.69% transfusion request on immediate postpartum haemorrhages at the maternity ward of Yaoundé General Hospital [8], Camara L found 13.5% transfusion request on first trimester haemorrhages [9] and Karembery C P found 10.4% demand for blood transfusion on third trimester hemorrhages [10]. Approximately 90% satisfaction of blood requests was found in a study carried out in two departments: the haematology-oncology department and the Medicine internal to the CHU du Point G [11] and 100%

satisfaction of blood requests was found by Samaké M [15]. In 1987, the Safe Motherhood Initiative was launched in Nairobi, followed by the 1990 World Summit for Children, both aimed to mobilize the international community to take action to halve maternal and neonatal mortality. In 2003, following the adoption of the Bamako Declaration, a workshop on reducing maternal and neonatal mortality in West and Central Africa was held. Organised under the impetus of the First Lady of Mali, it aimed to take stock of the progress made in the implementation of the Bamako Declaration in the 14 countries of West and Central Africa [13]. At a time when the services responsible for the collection and distribution of blood are facing difficulties in diversifying the quality of blood products in Mali, it is important to know the transfusion needs of the reference services of pathologies that cause situations leading to a need for blood transfusion. Our work aims to assess transfusion needs in obstetric emergencies in our department through the transfusion experience over a period of 6 months.

Objectives

The aim was to evaluate the role of blood transfusion in the management of obstetric emergencies in the gynaecology and obstetrics department at Gao Hospital.

PATIENTS AND METHODS

This was a prospective, descriptive, cross-sectional, analytical study from January 01 to June 30, 2020, i.e. a period of six (06) months in the gynecology-obstetrics department at Gao Hospital. The study population: this is the set of patients registered in the gynaecology-obstetrics department at Gao Hospital during the study period. They may be parturients referred in an emergency or who have come on their own for an antenatal consultation, a delivery or a post-natal consultation. Inclusion criteria: This is any pregnant, parturient and/or immediate postpartum woman admitted as an emergency, and who has received a blood transfusion. Non-inclusion criteria: Any pregnant, parturient and/or immediate postpartum woman admitted as an emergency, and who have not received any blood transfusion. Any pregnant woman whose examination and/or reading of the file does not reveal any urgency. Any non-pregnant woman admitted to hospital. Any admitted pregnant woman who has not received a blood transfusion during her treatment. Sample size: A comprehensive inventory was conducted of all cases that met the above inclusion criteria. Data security and analysis: Data was captured and analyzed using SPHINX software.

RESULTS

Epidemiological aspects

During our study, we recorded 536 cases of obstetric emergencies, of which 120 cases required emergency blood transfusion, i.e. 22.39%. The 20-29 age group was the most affected with an average age of 26.5



years. The extremes were 15 and 49 years old. About 95.8% of the transfused women were housewives. The Sonrhäi ethnic group was the most affected by blood transfusion, i.e. 75% of cases, followed by the Tamachec and the Fulani with 16.7% and 5% respectively. The majority of women transfused resided

outside the Gao circle, i.e. 42.5%. During our study, 99.2% of transfused patients were married. During our study, the majority of transfused patients were non-literate, i.e. 90% of cases. These epidemiological aspects are presented in Table 1.

Table-1: Epidemiological aspects

Age in year	Actual	Freq.
From 15 to 19	29	24,2%
20 to 29	61	50,8%
30 to 39	28	23,3%
40 and over	2	1,7%
Minimum = 15, Maximum = 49 Mean = 26.52 Standard deviation = 6.41		
Profession	Actual	Freq.
Housewife	115	95,8%
Pupil	4	3,3%
Other	1	0,8%
Ethnic group	Actual	Freq.
Sorhāi	90	75,0%
Fulani	6	5,0%
Tamachecque	20	16,7%
Bambara	1	0,8%
Other	3	2,5%
Origin	Actual	Freq.
Urban Commune of Gao	37	30,8%
Commune Inchawadi	0	0,0%
Municipality of Gabero	5	4,2%
Commune Gounzoureye	9	7,5%
Municipality of N'tilit	1	0,8%
Soni Aliber Municipality	17	14,2%
Tilemsi Municipality	0	0,0%
Outside the Gao Circle	51	42,5%
Marital status	Actual	Freq.
Bachelor	1	0,8%
Bride	119	99,2%
Educational attainment	Actual	Freq.
Not in school	108	90,0%
Primary	6	5,0%
Secondary	6	5,0%
Mean = 1.15 Standard deviation = 0.4		

Clinical aspects

Referral/Evacuation was the most frequent mode of admission in our series, followed by self-referral with 63.3% and 36.7% respectively. Bleeding during pregnancy and anaemic syndrome during pregnancy were the most frequently found reasons for admission during our study with 22.5% and 21.7% respectively. In our study, multi-gestures were the most represented with 31.7% of cases. The majority of transfused patients were multiparous with 27.5% of cases. Hypertension was the most common medical history, 5%, while 93.3% had no associated factors. 8.3% had a history of caesarean section. 5% of patients had poor general condition at admission. Our study found that 51.7% of patients had conjunctival pallor. Signs of decompensation (dizziness, dyspnea, palpitation,

hypotension) were present in 90.0% of cases. 34.2% of the women who had been transfused had already given birth. 40% of patients did not have PNC. 31.7% of transfused patients had made at least 1-3 antenatal visits and 60% of those who had no follow-up during pregnancy. 67.5% of patients had not received MS. Only 12.5% of patients performed NFS AND RBC-RH and 87.5% of patients achieved hemoglobin and RBC-RH. Patients with blood type O+ were the most represented, followed by B+ with 38.3% and 25.8% respectively. The majority of women transfused had a haemoglobin level between 4 and 6 g/dl, or 55.8%.

Characteristics of transfused products

Whole blood was the only blood product for blood transfusion, accounting for 100% of cases. In 39.2% of



the cases, we asked for 4 units of blood. 37.5% of patients had received at least 2 units of blood. During our study, 341 bags were prescribed, an average of 2.85 per patient. Of the 341 bags requested, 237 were served, which represents 69.5% of needs covered. The rate of unmet needs was 30.5% or 104 bags of blood. The length of hospitalization of less than 6 days was the most represented, accounting for 86.7% of cases.

Indications for blood transfusion

Retroplacental hematoma was the main indication for blood transfusion with 21.7% of cases. No obstetric procedure was performed in 37.5% of cases. Other: one case of hysterectomy. Tables 2, 3, 4, 5, 6 and 7 show us these clinical aspects.

Table-2: Clinical aspects

Method of admission	Nb. cit.	Freq.
Coming of Itself	44	36,7%
Refereed/Evacuated	76	63,3%
Reason for admission	Nb. cit.	Freq.
Pelvic pains	5	4,2%
Postpartum hemorrhage	13	10,8%
Bleeding during pregnancy	27	22,5%
Anemic syndrome on pregnancy	26	21,7%
Postpartum Anemic Syndrome	19	15,8%
Bleeding on amenorrhea	7	5,8%
CUD on pregnancy	6	5,0%
Other	17	14,2%
Gesture	Nb. cit.	Freq.
Primigestures	26	21,7%
Pauci-gestures	24	20,0%
Multi-gesture	38	31,7%
Great multi-gesture	32	26,7%
Minimum = 1, Maximum = 12 Mean = 4.11 Standard deviation = 2.61		
Parity	Nb. cit.	Freq.
Nulliparous	17	14,2%
Primiparous	22	18,3%
Pauci-pares	30	25,0%
Multiparous	33	27,5%
Large multiparous	18	15,0%
Minimum = 1, Maximum = 11 Mean = 3.72 Standard deviation = 2.26		

Table-3: Medical history

Medical history	Nb. cit.	Freq.
None	112	93,3%
HTA	6	5,0%
Sickle-cell anemia	2	1,7%
Surgical history	Nb. cit.	Freq.
Caesarean section	10	8,3%
No history	110	91,7%
General Admission Condition	Nb. cit.	Freq.
Good	104	86,7%
Passable	10	8,3%
Altered	6	5,0%
Conjunctival stains	Nb. cit.	Freq.
Good	17	14,2%
Average	41	34,2%
Pale	62	51,7%
Signs of decompensation	Nb. cit.	Freq.
Yes	108	90,0%
No	12	10,0%
Obstetric Profile	Nb. cit.	Freq.
Pregnant	31	25,8%



Parturient	37	30,8%
Postpartum	41	34,2%
Post-abortion	11	9,2%

Table-4: Distribution of Patients by Completion of NPC

NPC	Nb. cit.	Freq.
Made	72	60%
Not done	48	40%
Number of NPCs achieved	Nb. cit.	Freq.
None	72	60,0%
1-3	38	31,7%
4 and up	10	8,3%
Minimum = 1, Maximum = 5 Mean = 2.13 Standard deviation = 1.27		
Sulfadoxine-pyrimethamine number	Nb. cit.	Freq.
None	81	67,5%
SP1	20	16,6%
SP2	9	7,5%
SP3	8	6,7%
SP4	2	1,7%

Table-5: Distribution of patients by pre-transfusion assessment

Pre-transfusion assessment	Nb. cit.	Freq.
NFS and GR-RH	15	12,5%
Hb Tx and GR-RH	105	87,5%
Blood type	Nb. cit.	Freq.
No response	5	4,2%
A+	29	24,2%
B+	31	25,8%
AB+	0	0,0%
O+	46	38,3%
Has-	2	1,7%
B-	2	1,7%
AB-	1	0,8%
O-	4	3,3%
Hemoglobin level	Nb. cit.	Freq.
Less than 3.00	12	10,0%
From 4 to 6	67	55,8%
From 7 to 8	30	25,0%
8 to 9	6	5,0%
9 and up	5	4,2%
Minimum = 2, Maximum = 11 Mean = 5.69 Standard deviation = 2.17		

Table-6: Distribution of Patients by Blood Product Received

Transfused product	Nb. cit.	Freq.
Whole Blood	120	100%
Other	0	0,0%
Number of pockets requested	Nb. cit.	Freq.
1	13	10,8%
2	34	28,3%
3	19	15,8%
4	47	39,2%
5 and up	7	5,8%
Minimum = 1, Maximum = 5 Sum = 361 Mean = 3.01 Standard deviation = 1.16		
Number of Pockets Received	Nb. cit.	Freq.
1	39	32,5%
2	45	37,5%
3	36	30,0%
Length of hospitalization in days	Nb. cit.	Freq.
Less than 6	103	86,7%
From 6 to 10	9	7,5%
From 10 to 15	6	5,0%

15 and up	1	0,8%
Minimum = 1, Maximum = 19 Mean = 3.71 Standard deviation = 2.77		

Table-7: Distribution of Patients by Diagnosis

Diagnosis Retained	Nb. cit.	Freq.
HRP	26	21,7%
PPH	2	1,7%
GEU	3	2,5%
RU	8	6,7%
Molar abortion	4	3,3%
Severe anemia during pregnancy	22	18,3%
Hemorrhagic abortion	8	6,7%
Postpartum hemorrhage	25	20,8%
Paluster anemia	8	6,7%
Severe postpartum anemia	14	11,7%
Obstetric procedures performed	Nb. cit.	Freq.
Uterotonic (Misoprostol+Oxytocic)	24	20,0%
Caesarean section	10	8,3%
Hysterectomy	1	0,8%
AMIU+Misoprostol	10	8,3%
Uterine Revision +Misoprostol	17	14,2%
Hysterorrhaphy	8	6,7%
Salpingectomy	3	2,5%
Sutures of the parts +Misoprostol	2	1,7%
None	45	37,5%

Prognostic aspects

In 7.5% of patients experienced transfusion-related complications. 7.5% of cases presented with complications (malaria).70.0% of patients had a

haemoglobin level between 8 and 9 g/dl after transfusion. The majority of transfused patients were discharged from hospital (cured), i.e. 93.3%. Prognosis information is summarized in Table 8.

Table 8: Prognostic Aspects

Transfusion-related complications	Nb. cit.	Freq.
None	111	92,5%
Hives	3	2,5%
Shiver	6	5,0
Complications	Nb. cit.	Freq.
None	111	92,5%
Malaria	9	7,5%
Transfusion-related hemoglobin level	Nb. cit.	Freq.
From 7 to 8	5	4,2%
8 to 9	84	70,0%
10 and up	7	5,8%
From 10 to 11	7	5,8%
11 and up	4	3,4%
Not realized	13	10,8
Output Mode	Nb. cit.	Freq.
Cured	112	93,3%
Death	5	4,2%
Evacuated	0	0,0%
Discharge against medical advice	3	2,5%

DISCUSSION**Frequency of blood transfusion**

During the study period, we recorded 536 cases of obstetric emergencies, of which 120 cases were emergency blood transfusions, i.e. 22.39%. This result

is higher than those of Goïta A. in 2018 at the CSRéf of commune V of the district of Bamako [36], Maïga A. in 2020 at the CSRéf of San (Mali) [35] and significantly lower than that of Niantao D. in 2020 at the CSRéf of Fana [38] who had respectively found 13.42%,16.82%;



26.73%.

Sociodemographic profile of transfused patients

By age: Our study showed that the 20-29 age group was the most affected, i.e. 50.8% of patients. This could be explained by the fact that this age group corresponds to the period of active obstetric activity. Our study shows that the average age of women who have been transfused is 26.5 years. Our results are similar to the results of a study conducted in Benin at the Mother and Child Hospital Lagoon in Cotonou by AZANHOUE [39]; For this author, the 26-30 age group was the largest in need of transfusion. Another study conducted in Côte d'Ivoire at the COCODY University Hospital in Abidjan found that the average age of transfused patients was 30.06 years older than the results of our study [37]. This average age is lower than that of the study carried out in Tunisia by Ben Ayed: 30.74[40]. In France, a study carried out between 2001 and 2003 at the BELFORT University Hospital reported an age of patients at 28.26 years [41].

Occupation: Housewives were the most represented, accounting for 95.8% of cases. This result is similar to that of Sissoko F. in 2019[34] and Souleymane S. in 2011 at Gao Hospital [16] with 90.6% and 92.5% respectively, but significantly lower than that of Maïga A. in 2020 at the CSRéf de San [35], i.e. 98.3% of patients. This could be explained by the low literacy rate of housekeepers who are unaware of the danger signs of pregnancy and postpartum as well as the late use of health care. Ethnicity: The Sonrhäi were the dominant ethnic group in our series with a number of 90 out of 120 or 75% of the cases. This rate can be explained by the predominance of the Sonrhäi in the Gao region.

Origin: We found 51 cases out of 120 or 42.5% of patients from outside the Gao circle, on the other hand 37 out of 120 or 30.8% of patients from the circle. This could be explained by the large capacity of the service and its geographical position.

Marital status: Our patients were married 99.2% of the time, which is a factor to be encouraged, as a married woman can better manage her pregnancy given the support of family. However, singles accounted for only 0.8% in our series. Mode of admission: Evacuation was the most frequent mode of admission in our series, at 63.3% versus 36.7% of admission. This mode of admission is frequently encountered in many African studies. In the study of Goïta A. in 2018 and Maïga A. in 2020 in San (Mali) who had obtained 53.81% and 45.7% [35,36]. This could be explained by the level of education of our patients, who are mostly illiterate; ignore and neglect the signs of danger.

Reason for admission: Our study found that hemorrhage due to pregnancy was the leading reason for admission at 22.5%. This result is significantly lower than those of Souleymane S. in Mali in 2011 and

Samaké M. in Mali in 2008, who had recovered 39% and 43% respectively [15,16]. Gestation and parity: Multi-gestures were the most represented, accounting for 31.7% of cases. This same observation was made by Samaké M. in 2008 in Mali and Souleymane S in 2011 in Gao (Mali), with multi-gestures being the most represented, 35.4% and 32.3% respectively [15, 16]. On the other hand, in the work of Azanhoué in 2008 in Benin and Nientao D. in 2020, paucigestes were the most represented with 47.44% and 34.5% respectively [39,38]. Our study revealed that multiparous animals were the most represented, respectively 27.5% of cases. This same remark was made by Samaké M. in 2008 in Mali, in which multiparous and large multiparous women dominated the study, i.e. 33.8% and 29.3% respectively [15]. In the studies of Azanhoué in 2008 in Benin and Souleymane S. in 2011 in Gao (Mali), pauciparous women were the most represented, at 38% and 38.7 % respectively [39, 16].

Medical history: They were dominated by hypertension present in 5% of patients followed by sickle cell anemia 1.7%. It does not appear to correlate with the rate of blood transfusion. However, 93.3% had no associated factors. In the work of Samaké M. in Bamako and Sawadogo in Burkina Faso, the same medical history was most frequently encountered during their studies [15,37]. These results could be explained by the fact that these two entities are very common chronic pathologies. Surgical history: Regarding the surgical history, caesarean section (scarred uterus) was the most frequently observed surgical history, i.e. 8.3%. This same observation was made by Maïga A. in 2020 [35]. However, it is still accepted that the risk of bleeding is higher in scarred uterus.

Analysis of the clinical examination of the patients:

General examination: 5% of our patients had poor general condition at admission. Conjunctiva examination: Our study found that 51.7% of patients had pale conjunctiva on admission. This could explain the need for emergency blood transfusion. Obstetric profile: A proportion of 34.2% of transfused women had already given birth at admission followed by parturients. This could explain a significant risk of blood transfusion in the postpartum period. Number of PNCs performed: During the study, 31.7% of transfused patients had at least 1 to 3 prenatal visits, compared to 60% of those who had no follow-up during pregnancy. This result is similar to that of Maïga A. in 2020 in San who reported that 62.03% of patients did not have any prenatal consultation, but this result differs from that of Goïta A. in 2018 who had obtained 30.51% for 4 CPNs [35,36]. Characteristics of the products transfused: During our study, 341 whole blood bags were prescribed, an average of 2.85 per patient. Of the 341 bags requested, 237 were served, representing 69.5% of needs covered. The rate of unmet needs was 30.5% or 104 bags of blood. The 30.5% of unmet needs



are attributed to the lack of availability of the blood group as well as the voluntary donor. We used only whole blood, which could be explained by the fact that whole blood was still the most available blood product in the laboratory of the hospital in Gao. According to the indication for blood transfusion: Retroplacental hematoma and immediate postpartum hemorrhage were the main indications for blood transfusion with 21.7% and 20.8% of cases, respectively. This could be explained by the low coverage of antenatal preventive care as well as socio-economic and cultural factors. The prevention of obstetric haemorrhage is an essential means because it will reduce maternal and neonatal mortality and also the risks associated with the administration of blood from one individual to another.

According to the obstetric procedures associated with emergency blood transfusion: The use of uterotronics (misoprostol and oxytocin), uterine revisions, caesarean sections, hysterorrhies, hysterectomies, salpingectomies accounted for 20%, 14.2%, 8.3%, 6.7%, 0.8%, 2.5% respectively. The use of uterotronics could be explained by the frequency of postpartum haemorrhages due to uterine atony. 8.3% of patients underwent Manual Intrauterine Aspiration (MVA). This result is higher than that of Maïga A in 2020 [35] which obtained 5.1%. According to the additional examinations carried out: All the patients had received an emergency laboratory assessment, i.e. blood/rhesus grouping and Hb level before blood transfusion, i.e. 100% of cases. Women with blood type O+ were the most frequent, followed by B+ with 38.3% and 25.8% respectively. Most patients had an Hb level between 4 and 6 g/dl at admission, or 55.8% before blood transfusion. This could explain the need for emergency blood transfusion. Delay in evacuation for the management of obstetric haemorrhagic pathologies. The failure of his women to follow up on prenatal consultations. Post-transfusion parameters: Hb, BP, HR, RF were systematic after blood transfusion in 100% of cases. According to the complications that occurred during and after the blood transfusion: malaria and shivering-hyperthermia syndrome were the complications that occurred during our study, i.e. 7.5% and 5% respectively. Gasser, reported by Mannoni, observed after examining a long series of cases, the following facts [12]: Transfusion of an incompatible volume of blood less than 200 ml results in oliguria in 25% of cases without DIC or death. Illness greater than 500 ml results in oliguria in 45% of cases, DIC in 55% and death in 67%. Infusion of a volume between 200 and 500 ml leads to 27% of cases of oliguria, 22% of DIC and 33% of death.

According to maternal prognosis: Almost all patients had an improved prognosis after blood transfusion (93.3%) against a mortality rate of 4.2%. This mortality rate is higher than that of Maïga A. in 2020 [35] who had found 2.12% of deaths. On the other hand, it is similar to that of Souleymane S. in 2011 in Gao but clearly to that of Traoré M.L. at Gabriel University

Hospital, i.e. 4.3% and 17.8% respectively [16,12].

Conclusion: The rate of unmet obstetric needs is high. This high rate can have a negative impact on obstetric prognosis.

The limitations of the study: during our study, we were limited by the lack of blood at the laboratory of the Gao hospital, the total absence of other labile blood products, the non-availability of bags to collect donors.

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